broadly linear, scarcely compressed, 8–10 cm. long, 8–9 mm. wide, 3 mm. thick, dehiscent with difficulty if at all, apex blunt, rounded, mucronate, margins subentire, septa transverse, not well defined externally, hairs, if any, at the septal depressions, few and coarse and pointing toward apex: seeds 13–20, transverse, obovoid, 4 mm. long, 2 mm. in greatest diameter, funiculus straight.

Specimens examined; PENNSYLVANIA: Allegheny Co., 1900, *J. A. Shafer;* 1901, *J. M. Milligan.* Westmoreland Co., 1904, *O. P. Medsger* (type). MARYLAND: Cumberland, 1896, *Howard Shriver;* 1901, *Rev. G. Eifrig.* WEST VIRGINIA: Wheeling, 1879, *G. Guttenberg;* Sweet Springs, 1903 (*322*), *C. S. & Mrs. Steele.* VIRGINIA: Bedford Co., 1872, *A. H. Curtiss.* GEORGIA: Dalton, 1900 (*102*), *Percy Wilson.* ALABAMA: Clay Co., *F. S. Earle.* IOWA: Ringold Co., 1898, *Fitzpatrick Bros.* MISSOURI: Jackson Co., 1893 (*44*), and Campbell, 1895 (*195*), *B. F. Bush;* Riley Co., 1896, *J. B. Norton.* KANSAS: Johnson Co., 1892, *M. A. Carleton;* Ft. Riley, 1892 (*547*), *E. E. Gayle.* ARKANSAS: Lafayette Co., 1898, *A. A. & E. G. Heller;* Benton Co., 1899, *E. N. Plank.*

Cassia Medsgeri grows in dry gravelly situations, is less tall, less branched, of a darker color and is from ten days to two weeks later in flowering than *C. Marilandica*, from which it is easily distinguished by the differently shaped petiolar gland and stipules, less and differently pubescent ovary, darker, broader, and more curved pod, which is less clearly but more closely marked by the septa and almost indehiscent, also by the very differently shaped seeds.

NEW YORK BOTANICAL GARDEN.

A CASE OF IRREGULAR SECONDARY THICKENING

BY HERBERT MAULE RICHARDS

During last summer, while collecting in the woods in the neighborhood of Lake Placid, New York, the writer noticed that the lateral roots of the "yellow birch" — *Betula lutea* — often

presented a somewhat unusual appearance where they were growing over and around large rocks. The cross-section, instead of having the usual circular form, was more or less roughly elliptical, the roots being compressed laterally and expanded vertically. Such an appearance at once suggested unequal growth of the secondary layers of the wood and examination proved that this was the case.

In the specimen brought home and sectioned the greatest horizontal diameter of the root was 24 mm., while the vertical diameter measured 61 mm., exclusive of the rind, which was uniformly 1 mm. thick. As a result, the organ presented an almost plate-like form, suggestive of the supporting roots of some tropical trees. A section was obtained, thin enough to count the annual rings, and it could be seen that up to about its twenty-fifth year the development of the wood-layers was almost normal, with a slight tendency to epinastic growth (see figures). At this time the root had attained the diameter of about 16.5 mm., so that in breadth its subsequent growth was not more than 8 mm., while vertically it extended five and a half times as much. After the twenty-fifth year the annual rings were to be traced only with great difficulty on the sides, while above and below they were often 2 mm. and sometimes 4 mm. wide. There was not a great deal of difference in the rate of thickening on the upper and lower sides, though the hyponastic growth had a tendency to exceed the epinastic, especially from the thirty-third to forty-second years. The organic center of the root was then not greatly displaced from the actual axis of the organ. Such a condition has been described by C. Schimper as diplonasty. About 25 or 30 cm. further back, on the root, the hyponastic growth was more pronounced and more irregular. A hasty examination showed that the wood elements were smallest where the rings were compressed, but there seems also to be some difference in the number of wood-cells present in the different regions, being more, of course, where the ring was widest. This is worthy of notice because, in at least some cases of irregular thickening, it has been stated that the difference in the thickness of the rings was due alone to difference in the size of the wood elements.

Instances of irregular secondary thickening have been not infrequently cited. The classic examples of the plate roots in certain species of *Ficus*, or notably in the roots of *Parkia Africana*, may be mentioned, but there the excessive thickening is practically wholly epinastic. Epinastic or hyponastic thickening is mentioned by Haberlandt as occurring in the main branches of certain trees in the temperate region. Cases of diplonasty seem

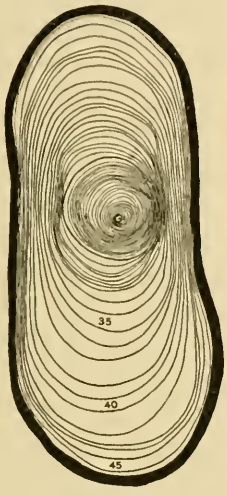

FIG. 1. Section of whole root showing rings of annual thickening. The numerals refer to the age. The twenty-fifth year is marked by a slightly heavier line. The rind is black. Nearly natural size.

FIG. 2. Enlarged view of transverse section of the first thirty years of growth. The annual rings are represented alternately black and white. Magnified about 3 diameters.

to be rarer. Specific instances do not seem to be generally cited in the ordinary literature; at least the writer was unable to find mention of any so well-marked case as that described above. Such irregularities are no doubt more common than one is led to believe from the references to them, and the writer would be glad to see specimens of this kind.

One naturally hesitates to make any too definite statement as to the causes of such thickenings, but Haberlandt's suggestion

that the abnormal growth is produced in response to mechanical exigencies is not unreasonable. Resting as these roots do on a hard, unyielding substratum, the compression strain brought to bear on them when the tree bends in the wind would be much greater than if they rested in soft soil. From a mechanical standpoint the vertical thickening of the wood would strengthen the root against such a strain. Such an explanation is certainly in accord with the general idea of the most economical expenditure of growth-energy and of material, which, as Haberlandt has pointed out, is as general in the development of trees as in any organisms.

Barnard College, New York.

THE BOLETACEAE OF PENNSYLVANIA

By D. R. Sumstine

Our state is well represented in the number of species belonging to this family. Nearly two thirds of all the species known in the United States have been reported from Pennsylvania. The following is a preliminary list of the genera and species.

Boletus affinis Peck §
albellus Peck §
alboater Schw.†
alutaceus Morg.§
alveolatus B. & C.‡
Americanus Peck *
auripes Peck §
auriporus Peck *
badiceps Peck §
betula Schw.†
bicolor Peck *
bovinus L.†
calopus Fr.†
castaneus Bull.*
chrysenteron Fr.*
chromapes Frost ‡
crassipes Peck §
decorus Frost §
dichrous Ellis ‡
edulis Bull.†
elegans Schum.§
eximius Peck ‡
felleus Bull.*
flavidus Fr.†
fragrans Vitt.§
Frostii Russell *
frustulosus Peck §
fulvus Peck §
glabellus Peck *
gracilis Peck ‡
granulatus L.*
griseus Frost *
illudens Peck §
impolitus Fr.§